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ABSTRACT

The view that there will be severe faculty shortages at Canadian universities in the 1990s is refuted, based on analyses concerning the demand for university teachers and the supply of doctoral graduates. In the 1990s when there is no foreseeable increase in university positions, replacement (i.e, due to retirement and mortality) will be the only significant demand factor. Most of the analyses that warn of impending faculty shortages have been based on the uneven age distribution of univesity teachers. However, factors that rejuvenate the faculty age structure, such as outward and inward mobility, have not been taken into account, as well as the future uncertainty of faculty retirement age. Important supply issues are recent changes in full-time doctoral enrollment and in the subsequent anticipated supply of doctoral graduates in Canada. In the early 1990s, the supply of doctoral degree-holders is likely to be at least as high as that of the period from 1986-1990. While the predicted staffing crisis for the 1990s appears to be a myth, individual disciplines may experience shortages. Supporting data include doctoral degrees by discipline for 1970 to 1984, projected supply of doctoral degrees for 1986 to 1990, and the proportion of female doctoral recipients by discipline. (SW)

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LE RÉSEAU CANADIEN DE RECHERCHE POUR L'ENSEIGNEMENT SUPÉRIEUR

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MYTHS AND REALITIES: THE MISCONCEPTION OF FACULTY SHORTAGES IN THE NEXT DECADE

by

Max von Zur-Muehlen

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MYTHS AND REALITIES: THE MISCONCEPTION OF FACULTY SHORTAGES IN THE NEXT DECADE

by Max von Zur-Muehlen*

October, 1986

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PREFACE

This working paper provides highlights from studies which the author has recently prepared and draws on other research undertaken over the last 15 years.[1] Of particular relevance are a 1985 Canadian Higher Education Research Network (CHERN) project entitled Doctoral Degrees in the Humanities and Social Sciences: The Past and the Future and some recent background studies dealing with the future supply of and demand for university teachers.

The data generated for this report are based on Statistics Canada series which have either been released in regular publications or developed by the author in the context of earlier documentation. It is hoped that this paper may elicit constructive responses.

An earlier version of this working paper was published by the Faculty of Administration at the University of Ottawa, in their Working Paper Series (86-39) under the title "The Supply and Demand for University Teachers: A Critical Review for the Next Decade". This revised edition has thus had the benefit of a number of thoughtful comments .

In the preparation of this study the diligent and patient research support and editorial assistance of Pam Denecky, Mark Shabaga, and in particular Colin Stewart are gratefully acknowledged. This project could not have been completed the last few months without the enduring tolerance of my family, especially my wife Giselle.

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MYTHS AND REALITIES: THE MISCONCEPTION OF FACULTY SHORTAGES IN THE NEXT DECADE

Over the last few years, the public in general and the university community in particular have harboured a number of notions about higher education. Issues such as the quality of university education, the type of research, and the adequacy of funding are by nature contentious and give rise to subjective evaluation. But even more objective and quantifiable issues have not been spared misconceptions.

Common wisdom within the university community has held, for example, that among undergraduates the proportion of older students was rising and that part-time enrolment in credit courses would increase more rapidly than full-time. These beliefs suggested that the dramatic 25 per cent decline in the 18-to-24-year-old source population between the mid-eighties and the mid-nineties would be at least partially offset by the changing composition of university enrolment.

Recent events, however, have refuted these assumptions. As a percentage of full-time undergraduates, 18-to-24-year-olds have remained stable at 85 per cent since the early seventies, and part-time credit enrolment has not grown to the extent that the full-time enrolment has. A 27 per cent jump in enrolment since 1978-79, unforeseen by many in the university community, has rendered these hypotheses invalid and irrelevant.

Another popular misconception in the academic community is that there will be severe faculty shortages at Canadian universities in the 1990s. This was suggested in the 1984 report of the Commission on Canadian Studies:

> Canadian universities will again be confronted in the coming decade with an acute shortage of qualified teachers and with the consequent prospect of once more having to import teaching staff in large numbers from other countries.[2]

Such arguments also surfaced in the second Five-Year Plans (1985-1990) of the Social Sciences and Humanities Research Council (SSHRC) and the Natural Sciences and Engineering Research Council (NSERC). Each warned that the supply of doctoral degree holders might be inadequate to satisfy the university faculty demand in the next decade. The SSHRC noted:

> If nothing is done over the next decade to remedy the situation, Canada will be forced once again to import large numbers of trained and experienced researchers from abroad in the 1990's.[3]

NSERC stated:

> In 1979, NSERC identified and quantified the serious attrition rate of the existing professoriate which will commence in earnest about 1990 and accelerate rapidly through the 90's. This fact, coupled with a lack of faculty positions for young people during the 1980's translates into critical shortages of professors in the decade ahead.[4]

It appears that the university community has accepted, without verification, this hypothesis and has joined the granting councils in requesting additional resources.

This working paper attempts to demonstrate that, happily, the supply of Canadian university teachers is likely to be adequate for many years to come.

The case against probable faculty shortages can be divided into two parts: the demand for university teachers and the supply of doctoral graduates.

On the demand side, the situation in the 1990s will be quite different from that of the 1960s and early 1970s, which was characterized by a major influx of foreign professors. At that time, the Canadian university system was expanding at a phenomenal rate. Total full-time faculty nearly quintupled, rising from 6,500 in 1960-61 to 31,600 in 1976-77; on average, about 1,500 new positions were added annually from the sixties to the mid-seventies. Growth since then has been more gradual: a 12 % increase to 35,500 in 1985-86. By contrast, in the 1990s, with no foreseeable increase in university positions, replacement (i.e. due to retirement and mortality) will be the only significant demand factor. Moreover, demand may possibly be lessened by the demographically induced enrolment decline foreseen for the late 1980s and early 1990s and/or by downsizing due to financial constraints. Shifts in student preferences may also affect the demand for faculty in certain disciplines.

Many of the analyses that warn of impending faculty shortages have based their conclusions on the uneven age distribution of university teachers. For example, in Ontario, the Bovey Commission noted the skewed faculty age structure and its academic implications:

> The abnormal faculty age distribution which has resulted from the dramatic increase in staffing in the 1960s and early 1970s has meant that with currently relatively few retirements, there are

> few openings for the present generation of young scholars and teachers. The presence of an appreciable number of talented new faculty would enhance instructional quality and adaptability and also assist in building up desired centers of strength in key developing fields of research and instruction.[5]

The small number of recent tenure-stream appointments has indeed led to an under-representation of certain age groups and to the potential loss of a generation of scholars.

The analyses by the Commission on Canadian Studies and the two granting councils are based on the somewhat unrealistic assumption that the age structure of the present professoriate can be mechanically projected five to ten years hence without accounting for intervening variables such as outward and inward mobility, which rejuvenates the faculty age structure, and the future uncertainty of faculty retirement age.

In fact, most Canadian reports have suggested a sudden loss of university faculty when a large part of today's age pyramid reaches the mandatory retirement age of 65. But current evidence indicates a more gradual retirement pattern. The Canadian Charter of Rights and Freedoms is likely to eliminate compulsory retirement at age 65, as certain provincial laws and regulations do already. At the same time, early retirement, work-sharing, faculty renewal and other incentive schemes have made the labour market for university teachers more flexible and dynamic. The magnitude of pension benefit schemes will also have an effect on the faculty's willingness to retire, as will inflation and the tax structure. The transition between employment and retirement in the 1990s will, therefore, differ greatly from the static assumptions made about it. The above-mentioned factors make any

retirement projections exceedingly difficult and complicate the prediction of demand for university teachers.

In recent years, over 2,000 new university appointments have been made each year, representing an annual turnover of about 7 per cent. Half of these new appointments were inter-university transfers, both within Canada and from abroad; others were temporary or term replacements and the remainder were in the tenure stream. The majority (about 80%) of the appointees were at the junior ranks. As a result, university faculty are not uniformly aging; the age structure is constantly being rejuvenated. Another characteristic of the new entrants is that only two-thirds of them held a doctorate at the time of their appointment. While most of them may eventually complete their doctoral degrees, this feature implies a certain flexibility in the labour market for university faculty.

All these factors contribute to a situation where the size of the replacement demand for university teachers is of neither the scale nor time frame suggested. Such uncertain demand considerations, however, must be related to future supply.

Most significant among faculty supply considerations are recent changes in full-time doctoral enrolment and in the subsequent anticipated supply of doctoral graduates from Canadian universities. During the last 10 years (1975 to 1984), an average of 1,850 doctorates were earned annually, 10 to 20 per cent of them by international (foreign) students (Table 1). At the same time, a sizable group of Canadian citizens and permanent residents is

TABLE 1a

DOCTORAL DEGREES IN THE DISCIPLINES OF THE HUMAN SCIENCES, 1970 TO 1984

Discipline	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
EDUCATION	78	77	109	122	128	172	157	173	157	193	205	203	213	189	206
FINE AND APPLIED ARTS	3	6	6	5	4	7	5	11	7	11	9	7	12	12	13
Classics	3	2	16	7	7	7	10	3	7	11	10	10	5	3	1
English	50	51	48	64	66	79	79	67	74	82	63	87	54	64	68
French	15	14	20	21	25	27	19	34	18	27	16	34	18	14	25
Other Modern Languages	22	25	17	23	42	32	33	35	37	29	32	32	33	33	41
History	29	37	49	35	47	61	55	52	48	54	39	39	42	40	42
Linguistics	4	5	4	8	6	11	12	7	12	11	10	16	14	13	2
Philosophy	15	32	31	44	50	44	33	35	48	56	41	40	41	58	41
Religious Studies	23	14	22	35	25	25	18	29	26	17	26	24	21	20	21
SUB-TOTAL HUMANITIES	161	180	207	237	269	288	259	263	271	291	242	285	232	245	251
Archaeology	1	1	1	4	6	1	2	1	3	-	2	5	8	1	3
Anthropology	5	6	4	10	15	9	22	15	24	23	19	19	17	21	25
Area Studies	9	15	15	12	27	12	21	13	10	19	6	17	17	15	3
Management & Admin. Studies	-	4	7	11	10	19	12	10	19	18	16	23	19	23	22
Environmental Studies	1	2	3	4	3	2	3	4	4	3	6	5	9	3	7
Economics	14	25	29	39	39	52	77	54	60	60	62	61	57	51	57
Geography	14	18	22	25	31	39	28	30	31	28	24	29	26	26	30
Law	3	15	10	4	4	7	9	5	4	6	3	8	3	18	7
Political Science	7	9	8	18	19	20	19	25	26	30	19	27	21	22	34
Psychology	86	119	109	121	133	148	152	142	169	154	184	185	152	155	169
Social Work	2	1	1	6	1	7	5	8	4	3	3	6	4	6	4
Sociology	11	12	15	23	31	41	46	43	57	51	58	41	45	44	48
SUB-TOTAL SOCIAL SCIENCES	158	228	226	279	319	357	397	350	411	397	403	427	378	385	411
TOTAL HUMAN SCIENCES	400	491	548	643	720	824	818	797	846	892	859	922	835	831	881
AGRICULTURE & BIO. SCIENCES	247	286	276	277	240	236	197	228	239	224	210	220	221	247	237
ENGINEERING & APPL. SCIENCES	191	234	262	299	301	227	188	203	224	231	191	215	183	220	184
HEALTH SCIENCES	87	93	118	157	153	122	105	105	125	134	137	113	151	155	170
MATHEMATICS & PHYSICAL SCIENCES	447	521	517	550	471	414	379	369	384	318	334	341	317	340	367
GRAND TOTAL	1,372	1,625	1,724	1,929	1,896	1,840	1,693	1,702	1,819	1,803	1,738	1,816	1,713	1,793	1,839

TABLE 1b

DOCTORAL DEGREES IN THE DISCIPLINES OF THE SCIENCES, 1970-1984

Discipline	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Agriculture	55	49	51	60	49	39	39	50	51	49	49	52	45	49	55
Biochemistry & Biophysics	40	77	48	50	24	32	23	25	29	14	27	28	31	31	38
Biology	64	76	92	80	64	76	73	82	78	87	77	70	81	97	81
Botany	33	30	25	27	28	27	16	21	18	11	11	21	9	15	11
Household Science	1	3	1	2	6	1	3	4	3	3	6	12	1	5	9
Veterinary Medicine	12	7	11	7	9	5	7	12	12	11	7	6	12	8	34
Zoology	42	44	48	51	60	56	36	34	48	49	33	31	42	42	237
SUB-TOTAL AGRICULTURE & BIOLOGICAL SCIENCES	247	286	276	277	240	236	197	228	239	224	210	220	221	247	
Chemical Engineering	37	46	54	51	51	46	36	34	34	26	26	34	32	35	28
Civil Engineering	32	37	58	60	52	41	19	33	36	60	31	34	31	35	32
Electrical Engineering	46	64	74	82	87	55	61	58	60	55	62	52	53	50	49
Mechanical Engineerig	35	42	36	52	43	32	25	38	36	26	22	27	29	32	35
Other Engineering	34	36	37	45	62	46	38	34	52	52	38	54	30	54	43
Sub-total Engineering	184	225	259	290	295	220	179	197	218	219	179	201	175	206	177
Forestry	7	9	3	9	6	6	8	5	6	11	9	13	6	12	7
SUB-TOTAL ENGINEERING AND APPLIED SCIENCES	191	234	262	299	301	226	187	202	224	230	188	214	281	218	184
Dental Studies	0	1	4	1	2	1	2	1	5	2	0	1	1	4	2
Medical Studies	65	68	94	116	112	81	79	76	99	89	127	105	135	128	150
Pharmacy	4	2	7	15	5	7	2	6	3	7	3	4	10	11	15
Other Health Sciences	18	22	13	25	34	33	22	22	18	36	7	3	5	12	3
SUB-TOTAL HEALTH SCIENCE	87	93	118	157	153	122	105	105	125	134	137	113	151	155	170
Chemistry	209	241	221	225	200	167	155	117	133	110	145	135	120	139	151
Computer Science	6	12	23	21	32	28	24	23	31	17	25	18	21	20	26
Geology	32	44	46	41	30	34	48	47	53	46	42	38	46	37	41
Mathematics	55	74	74	89	69	64	51	75	60	47	46	61	50	48	54
Physics	123	130	132	150	129	108	91	88	95	88	63	78	62	82	85
Other Physical Sciences	22	20	21	24	11	13	10	19	12	10	13	11	18	14	10
SUB-TOTAL MATHEMATICS AND PHYSICAL SCIENCES	447	521	517	550	471	414	379	369	384	318	334	341	317	340	367
TOTAL SCIENCES	972	1,134	1,173	1,283	1,165	998	868	904	972	906	869	888	970	960	958

obtaining doctoral qualifications in other countries and then returning to Canada. (The National Research Council in the United States reported 327 doctoral recipients with Canadian citizenship and permanent resident status for 1983-84). The result has been that each year, a total of over 1,500 new doctoral degree holders (excluding international students, but including doctoral degree recipients returning from abroad) were potentially available to the labour market. [6] Assuming that half of them would have liked to enter university teaching, as the pattern of the early 1980s suggests, 750 will be available each year between 1986 and 1990 (Table 2).

Although the simulation in Table 2 extends only to 1990, indications from 1986-87 data are that the annual number of doctoral degrees awarded in Canada will actually increase. This is supported by the 27% increase in full-time doctoral enrolment of Canadian citizens and permanent residents from 7,400 in 1981-82 to 9,400 in 1985-86 (Table 3) and by Statistics Canada's estimates, in Advance Statistics on Education 1986-87 that there will be 2,070 doctoral graduates in 1986 -- substantially above the annual average for the last decade. In the early nineties, the supply of doctoral degree-holders is likely to be at least as high as that of the period from 1986 to 1990.

In addition, since tenured positions have been limited in recent years, many doctoral graduates entered "holding patterns". These include term and sessional appointments, and programs such as NSERC's University Research Fellowships and the SSHRC's new Canada Research Fellowships. These two programs also strengthen the research capacity of Canadian universities and in this sense serve a dual function. Provincial faculty renewal funding

TABLE 2a

Projected supply of doctoral degrees for Canadian citizens and permanent residents for full- and part-time study, by discipline, 1986 to 1990

	Full- and part-time doctoral enrolment	With-drawal rate in percent	Balance	Length of study	Degrees granted each year 1986 to 1990	Full-time doctoral enrolment	With-drawal rate in percent	Balance	Length of study	Degrees granted each year 1986 to 1990
EDUCATION	1,779	50	890	5	178	1,020	50	510	5	102
Music	78	50	39	5	8	56	50	28	5	6
Fine and performing arts	45	50	23	5	5	39	50	20	5	4
SUB-TOTAL FINE AND PERFORMING ARTS	123	50	62	5	13	95	50	48	5	10
Classics	45	50	23	5	5	37	50	19	5	4
English	481	50	241	5	48	406	50	203	5	41
French	257	50	129	5	26	181	50	91	5	18
Other languages	295	50	148	5	30	242	50	121	5	24
History	466	50	233	6	39	351	50	176	6	29
Linguistics	148	50	74	5	15	102	50	51	5	10
Philosophy	353	50	177	4	44	227	50	114	4	29
Religious studies	280	50	140	6	23	199	50	100	6	17
SUB-TOTAL HUMANITIES	2,370	50	1,185	4 to 6	230	1,785	50	893	4 to 6	172
Anthropology and archaeology	234	50	117	5	23	192	50	96	5	19
Area studies	64	50	32	5	6	40	50	20	5	4
Management and administrative studies	259	50	130	5	26	202	50	101	5	20
Economics	278	50	139	5	28	207	50	104	5	21
Geography	166	50	83	5	17	125	50	63	5	13
Law	52	50	26	5	5	39	50	20	5	4
Environmental studies	35	50	18	5	4	25	50	13	5	3
Political science	325	50	163	7	23	237	50	119	7	17
Psychology	1,283	50	642	4.5	143	1,002	50	501	4.5	111
Social work	51	50	26	5	5	30	50	15	5	3
Sociology	436	50	218	5	44	294	50	147	5	29
SUB-TOTAL SOCIAL SCIENCES	3,184	50	1,592	4,3 to 7	324	2,394	50	1,197	4,5 to 7	244
TOTAL HUMAN SCIENCES	7,456	50	3,728	4 to 7	745	5,294	50	2,647	4 to 7	528

TABLE 2b

Projected supply of doctoral degrees for Canadian citizens and permanent residents from full- and part-time study, by discipline, 1986 to 1990

	Full- and part-time doctoral enrolment	With-drawal rate in percent	Balance	Length of study	Degrees granted each year 1986 to 1990	Full-time doctoral enrolment	With-drawal rate in percent	Balance	Length of study	Degrees granted each year 1986 to 1990
Agriculture	302	40	181	4	45	252	40	151	4	38
Biochemistry and biophysics	136	40	82	4	21	128	40	77	4	19
Biology	445	40	267	4	67	398	40	239	4	60
Botany	63	40	38	4	10	60	40	36	4	9
Household science	55	40	33	4	8	46	40	28	4	7
Veterinary medicine	53	40	32	4	8	46	40	28	4	7
Zoology	172	40	103	4	26	151	40	91	4	23
SUB-TOTAL AGRICULTURE & AND BIOLOGICAL SCIENCES	1,226	40	736	4	184	1,081	40	649	4	162
Chemical engineering	116	45	64	4	16	103	45	57	4	14
Civil engineering	162	45	89	5	18	128	45	70	5	14
Electrical engineering	253	45	139	4	35	202	45	111	4	28
Mechanical engineering	135	45	72	4	18	98	45	54	4	14
Other engineering	239	45	131	4	33	188	45	103	4	26
Forestry	69	45	38	5	8	57	45	31	5	6
SUB-TOTAL ENGINEERING & APPLIED SCIENCES	970	45	533	4-5	128	776	45	427	4-5	102
Dental studies	10	35	6	3	2	9	35	6	3	2
Medical and other health studies	814	40	488	4	122	682	40	409	4	102
Pharmacy	112	35	73	4	18	96	35	62	4	16
SUB-TOTAL HEALTH SCIENCES	936	35-45	567	3-4	142	787	35-45	477	3-4	120
Chemistry	528	45	290	4	73	491	45	270	4	63
Computer science	169	40	101	4	25	132	40	79	4	20
Geology	210	35	136	4	34	158	35	103	4	26
Mathematics	228	45	125	4	31	184	45	101	4	25
Physics	354	35	230	4	58	317	35	206	4	52
Other physical sciences	128	35	83	4	21	110	35	71	4	18
SUB-TOTAL MATHEMATICS & PHYSICAL SCIENCES	1,617	35-45	965	4	241	1,392	35-45	830	4	208
TOTAL SCIENCES	4,749	35-45	2,801	3 to 5	695	4,036	35-45	2,383	3 to 5	592
GRAND TOTAL - ALL DISCIPLINES	12,401	35-50	6,637	3 to 7	1,464	9,463	35-50	5,103	3 to 7	1,136
Other not identifed disciplines	196	45	108	4.5	24	133	45	73	4.5	16

TABLE 3

Full-time university students by level of study, 1972-73 to 1985-86

Academic year	Under-graduate	Master's	Doctoral	Other graduate	Sub-total graduate	Total
1972-73	272,627 (90.3)	17,080 (5.6)	7,263 (2.4)	4,996 (1.7)	29,339 (9.7)	301,966 (100.0)
1973-74	280,915 (90.3)	17,897 (5.8)	6,979 (2.2)	5,341 (1.7)	30,217 (9.7)	311,132 (100.0)
1974-75	293,098 (90.4)	18,795 (5.8)	6,934 (2.2)	5,219 (1.6)	30,948 (9.6)	324,046 (100.0)
1975-76	311,171 (90.4)	20,316 (5.9)	6,907 (2.0)	5,812 (1.7)	33,235 (9.6)	344,406 (100.0)
1976-77	315,784 (90.6)	20,683 (5.9)	6,871 (2.0)	5,326 (1.5)	32,880 (9.4)	348,664 (100.0)
1977-78	313,544 (90.4)	20,783 (6.0)	6,833 (2.0)	5,588 (1.6)	33,204 (9.6)	346,748 (100.0)
1978-79	307,118 (90.0)	21,207 (6.2)	6,808 (2.0)	6,156 (1.8)	34,171 (10.0)	341,289 (100.0)
1979-80	310,722 (89.9)	21,446 (6.2)	7,032 (2.1)	6,327 (1.8)	34,805 (10.1)	345,527 (100.0)
1980-81	318,954 (89.7)	22,372 (6.3)	7,190 (2.0)	6,916 (2.0)	36,478 (10.3)	355,432 (100.0)
1981-82	332,592 (89.7)	23,633 (6.4)	7,378 (2.0)	7,132 (1.9)	38,163 (10.3)	370,755 (100.0)
1982-83	352,062 (89.6)	25,346 (6.5)	7,861 (2.0)	7,454 (1.9)	40,661 (10.4)	392,723 (100.0)
1983-84	373,092 (89.5)	27,574 (6.6)	8,571 (2.1)	7,565 (1.8)	43,710 (10.5)	416,802 (100.0)
1984-85	383,388 (89.4)	28,320 (6.6)	9,312 (2.2)	7,654 (1.8)	45,286 (10.6)	428,674 (100.0)
1985-86P	392,051 (89.6)	28,451 (6.5)	9,368 (2.1)	7,702 (1.8)	45,521 (10.4)	437,572 (100.0)

Note: Excludes international (foreign) students.

programmes, such as those in Ontario and British Columbia, are another resource which have become popular as a means of rejuvenating faculty.

Another "holding pattern" is the increased number of female doctoral graduates who have not secured university employment. During the 1970s and early 1980s, the proportion of women among doctoral degree recipients increased from fewer than 1 in 10 to 1 in 4, but proportionately, fewer of them have been employed in universities (Table 4a and 4b). Only 16 per cent of full-time university teachers are women, and they tend to be concentrated in disciplines such as Education, Modern Languages and Literature, Nursing, and other Health Sciences.

Moreover, out of necessity, many recent doctoral graduates have entered other employment sectors, but still consider a university career their first choice and might, in the future, accept a university position.

These circumstances have created a reserve army of potential academics who could be activated when the need arises and when financial resources are available. Some of them may no longer be suited for a career shift to university employment, but many of them have gained valuable experience in the private and public sectors.

An alternative approach to simulating the supply of doctoral degrees also supports the prediction of an adequate supply of doctoral graduates for the next ten years. The relationship between total and doctoral full-time university enrolment is stable, as is the relationship between Master's and

TABLE 4a

Proportion of Female Doctoral Degrees in the Disciplines of the Human Sciences, 1970 to 1983

Discipline	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	14 year average
EDUCATION	20.5	6.5	10.1	18.9	13.3	29.1	29.3	24.3	24.8	29.0	39.5	36.5	42.7	43.9	29.1
FINE AND APPLIED ARTS	33.3	16.7	50.0	0.0	0.0	28.6	40.0	27.3	71.4	27.3	33.3	71.4	33.3	33.3	34.3
Classics	0.0	0.0	31.2	28.6	14.3	0.0	30.0	0.0	28.6	63.6	70.0	20.0	40.0	33.3	31.7
English	42.0	25.5	22.9	26.6	30.3	26.6	44.3	43.3	44.6	39.0	42.9	47.1	35.2	37.5	37.0
French	40.0	35.7	35.0	52.4	36.0	40.7	63.2	47.1	33.3	40.7	25.0	50.0	44.4	35.7	42.2
Other Modern Languages	18.2	44.0	41.2	34.8	42.9	37.5	48.5	48.6	48.6	37.9	43.7	40.6	54.5	54.5	43.5
History	20.7	10.8	6.1	2.9	14.9	11.5	20.0	26.9	16.7	25.9	28.2	23.1	26.2	15.0	17.9
Linguistics	0.0	0.0	0.0	12.5	66.7	54.5	50.0	42.9	16.7	27.3	30.0	62.5	50.0	46.1	38.3
Philosophy	20.0	9.4	16.1	9.1	16.0	20.5	24.2	8.6	18.8	23.2	19.5	27.5	26.8	22.4	20.1
Religious Studies	4.3	14.3	13.6	5.7	4.0	0.0	11.1	20.7	11.5	17.6	7.7	8.3	9.5	15.0	9.5
SUB-TOTAL HUMANITIES	25.5	21.1	19.8	19.4	25.7	23.6	33.9	33.8	29.9	32.6	32.6	36.8	34.5	32.2	28.5
Archaeology	0.0	0.0	0.0	25.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	40.0	12.5	27.3	27.7
Anthropology	0.0	0.0	0.0	40.0	13.3	44.4	18.2	46.7	20.8	34.8	21.1	36.8	64.7		
Area Studies	44.4	20.0	33.3	41.7	48.1	33.3	28.6	38.5	10.0	52.6	66.7	52.9	41.2	40.0	39.4
Management & Admin. Stud.	0.0	0.0	14.3	9.1	0.0	0.0	8.3	20.0	0.0	0.0	6.2	17.4	5.3	4.3	6.3
Environmental Studies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	40.0	22.2	33.3	11.5
Economics	7.1	8.0	17.2	0.0	10.3	7.7	6.5	11.1	11.7	13.3	8.1	11.5	14.0	9.8	9.8
Geography	7.1	0.0	9.1	8.0	6.5	7.7	7.1	6.7	6.5	10.7	12.5	3.4	11.5	11.5	7.8
Law	0.0	13.3	20.0	0.0	50.0	14.3	11.1	20.0	50.0	16.7	0.0	25.0	0.0	22.2	17.3
Political Science	0.0	0.0	12.5	16.7	10.5	10.0	10.5	8.0	15.4	13.3	10.5	37.0	9.5	7.1	13.3
Psychology	17.4	22.7	15.6	23.1	24.8	25.0	29.4	30.3	32.5	30.5	39.1	36.2	39.5	23.4	32.6
Social Work	0.0	0.0	0.0	16.7	100.0	42.9	20.0	25.0	25.0	33.3	0.0	33.3	0.0	33.3	24.6
Sociology	9.1	38.3	6.7	21.7	22.6	17.1	23.9	27.9	35.1	37.3	24.1	36.6	35.6	47.7	29.5
SUB-TOTAL SOCIAL SCI.	15.8	16.7	15.0	18.3	21.0	18.2	19.6	23.4	23.8	25.4	26.1	30.2	29.4	33.0	23.6
TOTAL HUMAN SCIENCES	20.7	16.7	16.2	18.7	21.2	22.5	26.8	27.1	26.4	28.6	31.2	34.0	34.3	34.9	26.7
AGRICULTURE & BIO. SCI.	8.5	8.7	11.6	13.4	11.2	17.4	19.8	11.4	16.7	13.8	23.3	22.3	23.1	20.2	15.5
ENGINEERING & APPL. SCI.	0.0	0.0	0.4	3.0	1.3	4.0	5.9	1.0	3.1	3.9	3.1	4.2	4.4	4.6	2.7
HEALTH SCIENCES	9.2	9.7	13.6	17.8	13.7	20.5	20.0	25.7	22.4	32.1	32.8	29.2	25.2	33.5	22.5
MATHEMATICS & PHYS. SCI.	3.6	6.7	4.3	4.2	6.6	7.2	7.4	9.5	8.6	9.7	8.4	10.0	11.4	12.9	7.4
GRAND TOTAL	9.3	9.3	9.3	11.3	12.4	15.9	18.9	18.0	18.2	20.5	22.9	24.2	24.5	24.9	17.2

TABLE 4b

Proportion of Female Doctoral Degrees in the Disciplines of the Sciences, 1970 to 1983

Discipline	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	14 year average
Agriculture	5.5	4.1	5.9	3.3	4.1	10.3	7.7	6.0	9.8	8.2	8.2	25.0	13.3	12.2	8.5
Biochemistry & Biophysiucs	7.5	15.6	18.7	28.0	12.5	28.1	34.8	16.0	34.5	14.3	44.4	25.0	19.4	9.7	22.1
Biology	9.4	6.6	12.0	7.5	12.5	19.7	20.5	14.6	16.7	18.4	24.7	15.7	23.5	22.7	15.6
Botany	12.1	13.3	12.0	18.5	21.4	22.2	6.2	14.3	16.7	9.1	18.2	19.0	33.3	40.0	16.3
Household Science	0.0	0.0	0.0	50.0	33.3	100.0	66.7	50.0	33.3	33.3	50.0	75.0	0.0	40.0	47.8
Veterinary Medicine	8.3	0.0	0.0	14.3	0.0	0.0	14.3	0.0	0.0	18.2	14.3	0.0	25.0	12.5	6.8
Zoology	9.5	4.5	12.5	15.7	10.0	10.7	25.0	5.9	16.7	10.2	24.2	16.1	33.3	23.8	14.5
SUB-TOTAL AGRICULTURE & BIOLOGICAL SCIENCES	8.5	8.7	11.6	13.4	11.2	17.4	19.8	11.4	16.7	13.8	23.3	22.3	23.1	20.2	15.1
Chemical Engineering	0.0	0.0	0.0	0.0	0.0	4.3	11.1	2.9	0.0	3.8	3.8	0.0	6.2	5.7	2.2
Civil Engineering	0.0	0.0	0.0	3.3	0.0	0.0	5.3	0.0	2.8	3.3	6.5	0.0	12.9	5.7	2.3
Electrical Engineering	0.0	0.0	1.4	8.5	2.3	3.6	0.0	1.7	1.7	9.1	3.2	11.5	0.0	0.0	3.3
Mechanical Engineerig	0.0	0.0	0.0	0.0	0.0	6.2	12.0	0.0	5.6	0.0	0.0	0.0	3.4	3.1	1.8
Other Engineering	0.0	0.0	0.0	0.0	3.2	4.3	5.3	0.0	3.8	1.9	0.0	1.9	3.3	7.4	2.0
Sub-total Engineering	0.0	0.0	0.4	3.1	1.4	3.6	5.6	1.0	2.8	4.1	2.8	3.5	4.6	4.3	2.4
Forestry	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	16.7	0.0	0.0	15.4	0.0	8.3	4.1
SUB-TOTAL ENGINEERING AND APPLIED SCIENCES	0.0	0.0	0.4	3.0	1.3	4.0	5.9	1.0	3.1	3.9	3.1	4.2	4.4	4.6	2.6
Dental Studies	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	50.0	9.5
Medical Studies	7.7	7.4	10.6	16.4	14.3	18.5	21.5	25.0	22.2	30.3	31.5	26.7	24.4	35.2	19.5
Pharmacy	0.0	0.0	0.0	26.7	0.0	28.6	0.0	33.3	33.3	14.3	66.7	50.0	20.0	9.1	23.4
Other Health Sciences	16.7	18.2	38.5	20.0	14.7	24.2	18.2	27.3	27.8	41.7	42.9	66.7	60.0	33.3	26.4
SUB-TOTAL HEALTH SCIENCES	9.2	9.7	13.6	17.8	13.7	20.5	20.0	25.7	22.4	32.1	32.8	29.2	25.2	33.6	21.4
Chemistry	2.4	9.1	5.9	7.6	7.0	10.2	9.0	12.0	13.5	14.5	11.0	11.1	15.0	17.3	9.1
Computer Science	0.0	0.0	0.0	0.0	3.1	3.6	8.3	0.0	9.7	5.9	8.0	16.7	0.0	10.0	4.6
Geology	0.0	2.3	0.0	2.4	0.0	2.9	4.2	8.5	7.5	6.5	4.8	7.9	8.7	10.8	4.6
Mathematics	10.9	6.8	5.4	2.2	7.2	7.8	15.7	17.3	5.0	8.5	6.5	11.5	10.0	12.5	8.6
Physics	4.1	4.6	2.3	2.0	6.2	3.7	2.2	3.4	5.3	6.8	4.8	7.7	11.3	7.3	4.6
Other Physical Sciences	0.0	5.0	9.5	0.0	0.0	15.4	0.0	5.3	0.0	10.0	15.4	0.0	11.1	14.3	5.4
SUB-TOTAL MATHEMATICS AND PHYSICAL SCIENCES	3.6	6.7	4.3	4.2	6.0	7.2	7.4	9.5	8.6	9.7	8.4	10.0	11.4	12.9	7.1
TOTAL SCIENCES	4.6	6.1	6.1	7.6	6.9	10.5	11.4	9.9	11.3	12.6	14.7	14.1	15.3	16.2	10.0

Doctoral degrees. During the last decade, doctoral students have consistently represented just over 2 per cent of total full-time university enrolment.[7] Since total full-time enrolment is at an all-time high (estimated at 440,000 in 1986-87, excluding international students), continued growth of doctoral enrolment, and consequently the supply of doctoral graduates, can be predicted over the next decade. Since it takes about ten years from first-year enrolment to doctoral completion (including post-doctoral studies), the potential supply of new university teachers can be projected with reasonable certainty to 1995.

Another feature of present graduate enrolment is that the age distribution of doctoral students has shifted toward the older ages. This reflects the fact that more students are temporarily postponing graduate studies in order to gain experience or earn money; as a result, the time horizon for entry into the labour market as potential faculty is extended two or three years for students presently at the undergraduate level.

The university environment of the 1990s will differ substantially from that of the past and present in a variety of respects. In the last two decades, Canadian universities have greatly developed their graduate programs. These programs are achieving maturity in the 1980s, and will enable Canadian universities to respond to demands for highly qualified manpower much more readily and expeditiously than in the sixties and early seventies when the infrastructure did not exist. The anticipated adequacy of supply is fortuitous, because it is unlikely that other industrial countries, particularly the United States, will have a surplus of university teachers as their own

universities experience a strong replacement demand. An international shortage of university teachers already exists in a number of key areas such as Management and the technology-intensive fields, as well as in some applied disciplines of the Humanities and Social Sciences.

In re-interpreting the demand and supply factors for university teachers for the next ten years, an overall picture very different from the one suggested by the two Granting Councils and the Commission on Canadian Studies is emerging. These reports, which reflected the perceptions of the early eighties, were based on assumptions that were cumulatively biased on both the supply and demand sides, thereby compounding the possibility of error and creating a future imbalance. This led to dramatic assertions that Canada would face a severe shortage of university teachers in the 1990s. However, annual replacement demand (retirement and mortality), derived from the present age structure, would be 500 to 600 annually (Table 5). Only two-thirds (i.e., 330 to 400) of the entry positions likely to be open will require doctoral qualifications. This figure can be compared with the predicted supply of 1,500 doctoral degrees (including returning Canadians) awarded each year. As noted, a minimum of half of them (750) would be available for university teaching.

Therefore, the supply-demand ratio is two to one. Thus, while current literature presumed a somewhat reversed ratio, and consequently, a dangerous faculty shortage, the available evidence negates an imminent faculty supply crisis in the 1990s. Even if some premises are modified, on both the supply and demand sides, this outcome would not be dramatically affected. Only

TABLE 5

ESTIMATED SUPPLY OF DOCTORAL DEGREES FOR UNIVERSITY TEACHING RELATED TO THE REPLACEMENT DEMAND, 1986 TO 1990

SELECTED DISCIPLINE	SUPPLY					DEMAND					BALANCE
	DOCTORAL DEGREES AWARDED TO CANADIANS IN CANADA	AVAILABLE FOR UNIVERSITY TEACHING		CANADIANS RECEIVING DOCTORAL DEGREES ABROAD AND RETURNING TO CANADA	TOTAL SUPPLY	ANTICIPATED NUMBER OF RETIREMENTS	MORTALITY (0.5%)	SUB-TOTAL DEMAND	PERCENTAGE REQUIRED WITH A DOCTORAL DEGREE	TOTAL DEMAND	AVERAGE ANNUAL SURPLUS OR DEFICIT
		PERCENTAGE	NUMBER								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
EDUCATION	102	38.4	39	15	54	50	16	66	75.0	50	4
MUSIC	6	100.0	6	2	8	6	3	9	35.2	3	5
CLASSICS	4	100.0	4	2	6	4	1	5	76.5	4	2
HISTORY	29	58.0	17	8	25	17	5	22	87.7	19	6
MODERN AND MEDIAEVAL LANGUAGES AND LITERATURE	83	71.9	60	10	70	48	14	62	72.8	45	25
PHILOSOPHY	29	64.0	19	5	24	9	3	12	81.9	10	14
RELIGIOUS STUDIES	17	76.2	13	1	14	7	3	10	74.5	7	7
ANTHROPOLOGY AND ARCHAEOLOGY	19	60.0	11	0	11	5	2	7	88.3	6	5
AREA STUDIES	4	51.2	2	3	5	2	1	3	69.1	2	3
MANAGEMENT AND ADMINISTRATIVE STUDIES	20	88.1	18	9	27	17	10	27	48.8	13	14
ECONOMICS	21	56.8	12	10	22	14	6	20	75.8	15	7
GEOGRAPHY	13	62.5	8	3	11	7	3	10	84.1	8	3
LAW	4	85.7	3	2	5	4	3	7	14.1	1	4
LINGUISTICS	10	68.2	7	1	8	0	1	1	79.8	1	7
ENVIRONMENTAL STUDIES	3	58.3	2	0	2	4	1	5	60.3	3	-1
POLITICAL SCIENCE	17	70.5	12	5	17	10	4	14	79.4	11	6
PSYCHOLOGY	111	32.3	36	15	51	11	7	18	90.1	16	35
SOCIAL WORK	3	81.8	2	1	3	7	2	9	41.0	4	-1
SOCIOLOGY	29	64.7	19	5	24	10	4	14	81.6	11	13
AGRICULTURE	38	37.0	14	6	20	8	2	10	82.2	8	12
BIOCHEMISTRY	19	42.9	8	0	8	1	1	2	96.5	2	6
BIOLOGY	60	32.7	20	5	25	7	4	11	87.0	10	15
BOTANY	9	56.6	5	8	13	2	1	3	89.2	3	10
HOUSEHOLD SCIENCE	7	50.0	4	0	4	4	1	5	53.8	3	1
VETERINARY SCIENCE	7	30.0	2	3	5	2	1	3	48.0	1	4
ZOOLOGY	23	34.9	8	8	16	2	1	3	94.2	3	13
ENGINEERING INCLUDING ENGINEERING SCIENCE	96	30.6	29	14	43	30	11	41	73.4	30	13
FORESTRY	6	33.3	2	1	3	4	0	4	64.2	3	0
DENTISTRY	2	48.2	1	1	2	6	2	8	23.0	2	0
PHARMACY	16	48.2	8	2	10	2	1	3	72.9	2	8
MATHEMATICS AND STATISTICS	25	72.2	18	12	30	15	10	25	80.1	20	10
CHEMISTRY	63	28.3	18	10	28	8	5	13	91.0	12	16
GEOLOGY	26	27.0	7	8	15	4	2	6	92.8	6	9
PHYSICS	52	35.3	18	13	31	17	5	22	91.4	20	11
SUB-TOTAL	973	46.5	452	179	631	354	137	491	72.1	354	277
OTHER DISCIPLINES	163	46.9	76	42	118	65	29	94	42.4	40	78
GRAND TOTAL	1,136	46.5	528	221	749	419	166	585	67.4	394	355

EXPLANATORY NOTES FOR TABLE 5

Column 1 has been derived from the estimated 1985-86 full- and part-time doctoral enrolment of Canadian citizens and permanent residents, excluding international students.

Column 2 shows the percentage of doctoral degree holders who entered university teaching, on a discipline basis. This is the 4 year average from the 1981 to 1984 Survey of Doctoral Degree Recipients.

Column 3 provides the number of doctoral degree holders who would be available for a university appointment.

Column 4 estimates the number of Canadian citizens and permanent residents who are obtaining their doctoral degree abroad and plan to return to Canada with the intention of obtaining a university appointment.

Column 5 combines column 3 with column 4, showing the potential total supply of doctoral degree recipients available for university teaching.

Column 6 estimates, from the current age structure, by single year, the number of retirements which are likely to occur (i.e. those who reach the age of 65 within the next five years). The average for the five year period has been used.

Column 7 gives the mortality rate (0.5%) of university teachers in the present age structure.

Column 8 combines the number of retirements with the estimated number of mortality shown in columns 6 and 7. Although there is inward and outward mobility of university teachers to and from other employment sectors, for the purpose of this study the net migration has been assumed to be zero (e.g. as many university teachers leave to other employment opportunites as are replaced from the private, government sectors, and other sectors).

Column 9: Traditionally only a certain proportion of university teachers have held doctoral qualifications, and these percentage figures have been derived from the current pattern by discipline for new appointments varying substantially by discipline.

Column 10 summarizes the total demand for university teachers in columns 6,7,8, and 9.

Column 11 relates column 5 (supply) to column 10 (demand) showing the imbalance in the form of surplus or deficit for each of the disciplines identified. These figures have been calculated for a 5 year period (1986 to 1990) by calculating the annual average.

under radically different assumptions, such as exceptionally strong growth in the Canadian economy, a substantial increase in research and development expenditures, or a massive injection of financial resources to reduce the student-faculty ratio, might there be a shortage of university faculty with doctoral qualifications. These possibilities seem very remote

The overall analysis presented here, which covers well over 50 disciplines, has to be modified for specific disciplines in which enrolment might decline and replacement positions might not be filled, and for those which might grow such as Management and Computer Science. If demand due to growth persists, the doctoral supply may be inadequate for these disciplines. Thus, for each of the over 50 disciplines, a different supply-demand profile emerges. Since substitution between disciplines is limited, demand and supply for each one must be addressed separately, but the overall picture is not changed. Invariably, most disciplines will have substantial surpluses of potential university teachers, however the majority of doctoral degree holders will have alternate employment opportunities.

It is always tempting to speculate on the future, even without an adequate information base, since one is unlikely to be held accountable. The popular assumption of impending severe faculty shortages appears to be a reflection of this syndrome and seems to have been accepted as a truism. However, this is not only unfair to potential doctoral students who might be considering university teaching as a career, but also poses the danger of a misallocation of scarce resources. The argument in favour of additional resources for doctoral training should not be based on projected shortages of highly

qualified manpower in the next decade, but rather on the under-funding of universities in general and of research support in particular.

In conclusion, recent predictions of another staffing crisis in Canadian universities in the 1990s appear to be a myth. Of course, individual disciplines may experience shortages; some do today. It is exceedingly difficult to achieve a perfect balance in the employment market for university teachers, since student choices, existing financial support for students, budgetary constraints, and incentive programs influence both supply and demand. A long lead time is necessary to complete a doctoral degree, whereas labour market demand changes rapidly. Also, university appointments often require very specific qualifications and work experience. It may still be necessary for Canada to rely on the international labour market for certain specialized talent.

Nonetheless, the apparent adequate supply of doctoral degree holders for the next ten years resolves some uncertainties for the universities and the government, and is welcome news. It provides universities with an opportunity to address other issues such as the quality of university education and research as well as their mandate and mission.

REFERENCES AND NOTES

[1] Some of the more relevant publications are:

a) Max von Zur-Muehlen, "The Ph.D. Dilemna in Canada: A Case Study" in Canadian Higher Education in the Seventies (Ottawa: Economic Council of Canada, 1972) pp. 75-131

b) ----------, "The Ph.D. Dilemma in Canada Revisited" in Canadian Journal of Higher Education Vol. 8, No. 2, (Toronto: University of Toronto Free Press, 1977) pp. 49-91.

c) ----------, "Canadian Concerns in Higher Education", paper presented to the Ontario Institute for Studies in Education's Higher Education Group Colloquium, January 1978.

d) ----------, "The Age Structure of Canadian University Teachers and its Implications", in Interchange on Educational Policy (Toronto: Ontario Institute for Studies in Education, 1979) Vol. 10, No. 3.

e) ----------, "The Changing Profile of Full-time Faculty at Canadian Universities" in The Canadian Journal of Higher Education, (Toronto: University of Toronto Free Press, 1983) vol. 13, No. 2, pp. 27-40.

[2] Thomas H.B. Symons, and James E. Page, Some Questions of Balance: Human Resources, Higher Education and Canadian Studies (Ottawa: Association of Universities and Colleges of Canada, 1984) p. 32.

[3] SSHRC, Five-Year Plan for Financing Research in the Social Sciences and Humanities. 1985-1990 (Ottawa: SSHRC, 1985) p. 45.

[4] NSERC, Completing the Bridge to the 90's. A Second Five-Year Plan for the Programs of the Natural Sciences and Engineering Research Council (Ottawa: NSERC, June 1985) p. 23.

[5] The Commission on the Future Development of the Universities of Ontario (Bovey Commission), Ontario Universities: Options and Futures (Toronto: December 1984) p. 21.

[6] Recent studies have suggested that doctoral enrolment may be a function of employment opportunities for bachelor's degree-holders. This, however, seems contrary to the stable relationship between total university and doctoral enrolment which has been evident over the last decade. Another relationship which seems unlikely, for a variety of reasons, is the one between faculty supply/demand considerations and price elasticities. Moreover, salary structures, on a discipline basis, are not so much influenced by supply/demand factors as they are subject to the collective agreements in many universities which make salary differentiations difficult. These issues are not explored in this working paper.

[7] This simulation exercise is derived from estimated 1985-86 data on full- and part-time doctoral enrolment of Canadian citizens and permanent residents. Based on past cohort analysis, the withdrawal rate and length of study were calculated, taking into account variations for each discipline. Table 2 predicts the average annual number of doctoral degrees to be awarded during the five year period between 1986 and 1990; Table 5 shows calculations of doctoral supply and demand relating to university teachers, and considers retirement and mortality patterns for the same period. This table indicates, on a discipline basis, the anticipated surplus or deficit without considering the demand due to growth or to possible quality improvements. These tables do not take into account international students with doctoral qualifications, or visiting scholars, who stay on in Canada and eventually become permanent residents, nor future immigrants. Such variable contribute further to the supply data (see also the explanatory notes for Table 5).